

1. A radio frequency power amplifier system comprising:
 - a power amplifier configured to receive a radio frequency input signal and to provide an amplified radio frequency output signal, the power amplifier including a first stage and a second stage;
 - a first power converter configured to receive a first input voltage and generate a first output voltage, the first power converter being configured to provide the first output voltage to the first stage and to the second stage responsive to a first mode of operation; and
 - a second power converter configured to receive a second input voltage and generate a second output voltage, the second power converter being configured to provide at least a portion of the second output voltage to the second stage responsive to a second mode of operation.
2. The radio frequency power amplifier system of claim 1 further comprising an amplitude detector configured to generate an amplitude signal indicative of an amplitude envelope of the radio frequency input signal.
3. The radio frequency power amplifier system of claim 2 further comprising a controller configured to select one of the first mode of operation and the second mode of operation based on the amplitude signal.
4. The radio frequency power amplifier system of claim 1 wherein the second power converter is configured to be disabled responsive to the first mode of operation.
5. The radio frequency power amplifier system of claim 1 further comprising a third power converter configured to receive the first output voltage and generate a third output voltage.
6. The radio frequency power amplifier system of claim 5 further comprising a power combiner coupled to the second power converter and the third power converter, the power combiner configured to combine the second output voltage with the third output voltage to generate a fourth output voltage.
7. The radio frequency power amplifier system of claim 6 wherein the first power converter is configured to provide the first output voltage to the first stage and the power combiner is configured to provide the fourth output voltage to the second stage responsive to a third mode of operation.
8. The radio frequency power amplifier system of claim 5 wherein the third power converter is configured to be disabled responsive to at least one of the first mode of operation and the second mode of operation.
9. The radio frequency power amplifier system of claim 1 wherein the second power converter is configured to selectively receive at least one of the first input voltage and the first output voltage as the second input voltage.
10. A method of providing power to a radio frequency power amplifier, the method comprising:
 - converting a first input voltage to a first output voltage;
 - providing the first output voltage to a first stage of the radio frequency power amplifier and to a second stage of the radio frequency power amplifier in a first mode of operation;

converting a second input voltage to a second output voltage in a second mode of operation; and
 providing, in the second mode of operation, the first output voltage to the first stage of the radio frequency power amplifier and at least a portion of the second output voltage to the second stage of the radio frequency power amplifier.

11. The method of claim 10 further comprising detecting an amplitude of a radio frequency input signal and selecting one of the first mode of operation and the second mode of operation based on the amplitude.

12. The method of claim 10 further comprising converting the first output voltage into a third output voltage, combining the second output voltage and the third output voltage into a fourth output voltage, and providing the fourth output voltage to the second stage.

13. The method of claim 10 further comprising selecting at least one of the first input voltage and the first output voltage to be the second input voltage.

14. A method of providing power to a power amplifier, the method comprising:

- detecting an amplitude of an input signal;
- comparing the amplitude to a signal threshold;
- selectively providing at least one of a first converted voltage and a second converted voltage to the power amplifier in response to the amplitude being lower than the signal threshold; and
- combining the second converted voltage and a third converted voltage to provide a combined voltage to the power amplifier in response to the amplitude being higher than the signal threshold.

15. The method of claim 14 wherein the third converted voltage is capable of higher frequency operation than the second converted voltage.

16. The method of claim 14 wherein selectively providing at least one of a first converted voltage and a second converted voltage to the power amplifier in response to the amplitude being lower than the threshold includes providing the first converted voltage to the power amplifier responsive to a target voltage level being above a voltage threshold and providing the second converted voltage to the power amplifier responsive to the target voltage level being below the voltage threshold.

17. The method of claim 14 wherein selectively providing the first converted voltage includes one of increasing and decreasing a battery voltage.

18. The method of claim 14 wherein the second converted voltage is provided by converting a battery voltage when the battery voltage is above a battery threshold and converting the first converted voltage when the battery voltage is below the battery threshold.

19. The method of claim 14 wherein the second converted voltage is provided by converting an input voltage by a buck converter.

20. The method of claim 14 further comprising providing the third converted voltage by a linear converter.

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